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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
HUNG, YUBIN	

ART UNIT	PAPER NUMBER
2624	

DATE MAILED: 07/20/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/006,999	FABER ET AL.	
	Examiner	Art Unit	
	Yubin Hung	2624	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-5,7-10,12-18 and 38-41* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *12-18 and 39* is/are allowed.

6)☒ Claim(s) *2-5, 7-10, 40 & 41* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 December 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 15, 2006 has been entered.

Response to Amendment/Arguments

2. Claims 1, 6, 11 and 19-38 have been cancelled; claim 41 has been added; claims 2-5, 7-10, 12-18 and 39-41 are still pending.

3. Applicant's amendment has rendered moot the 35 USC § 103 rejections of claims 2-5, 7-10, 40 and 41. However, upon further consideration, a new ground(s) of rejection is made; see below.

DETAILED ACTION

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 2-5, 7-10, 40 and 41 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Specifically, independent claim 40 is amended to add the limitation "the method further comprising determining an order in which to perform the successive combination of steps and determining one or more values to use in the steps to minimize the error difference" for which the support cannot be found on the cited pages (see P. 9, last two paragraphs of the response). [Proposition 6.1 on P. 34 of the specification only proves the existence of the optimal bijection; lines 7-8 on P. 35 expressly disclose that the proof is non-constructive (and therefore not amenable to the design of a corresponding algorithm, or method, and none is given). Proposition 6.2 (P. 36) only shows that in a special case (i.e., with a rational matrix, and therefore is **narrower in scope** than in

claim 40) the optimal solution can be found by searching a subspace (i.e., all periodic integer approximations), and again, no algorithm is offered here, nor on pages 39, 41 and 42.] All of the dependent claims of claim 41 inherit the same problem.

In addition, pages 29 and 30 of the specification are alleged (P. 10, last two lines of the response) to provide support for new claim 41. However, matrix $S^{-1}A$ is understood to generate a first plurality of output data values that approximate a second plurality of output data values generated by applying a linear transform, A (see P. 30, lines 16-18 of the specification). This being the case, there is no evidence that all limitations of its parent claim (claim 40), especially the last limitation in which the error difference is minimized, are satisfied by $S^{-1}A$.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 2-3, 7-10, 40 and 41 are rejected under 35 U.S.C. 102(b) as being anticipated by Gormish et al. ("Lossless and nearly lossless compression for high quality images," *Proc. SPIE*, Vol. 3025, March 1997, pp. 62-70).

8. Regarding claim 40, Gormish discloses

- transforming a plurality of input data values using a computer, the first plurality of output data values approximating a second plurality of output data values, the second plurality of output data values generated by applying a linear transform to the plurality of input data values, the method comprising *at least one step that is equivalent to a successive combination of one or more steps of the following steps*:
  - o rearranging at least one data value in a plurality of current input data values
  - o negating at least one data value in the plurality of current input data values
  - o modifying at least one data value in the plurality of current input data values, each modified data value generated by applying a linear combination of unmodified values in the plurality of input data values to the at least one data value, the linear combination comprised of an integer generated in a reproducible manner

[P. 63, Eq. 1; P. 64, Eqs. 2-4. Note that (R,G,B) represents input data values: (Y_r,U_r,V_r) represents the 1st plurality of output data values; and (Y,U_r,V_r), where $Y = (R+2G+B)/4$, represents the 2nd plurality of output data values. The linear transform is defined by $Y = (R+2G+B)/4$, $U_r = R-G$ and $V_r = B-G$. Note further that the computations of U_r and V_r involve negating at least one data value (G in both cases) and the computation of Y_r involves linear combination and generating an integer in a reproducible manner by using a floor function (i.e., to generate a "converted" integer. Therefore, Eq. 1 involves one or more of the three steps of the claim]

  - o wherein an error difference between the first plurality of output data values and the second plurality of output data values is bounded

[P. 63, Eq. 1. Note that the difference between (Y_r,U_r,V_r), the 1st plurality of output data values, and (Y,U_r,V_r), the 2nd plurality of output data values, is $(Y_r-Y,0,0)$. Since for any Y, $|Y_r-Y|$ is less than one, the error difference is bounded]

  - o the method further comprising determining an order in which to perform the successive combination of steps and determining one or more values to use in the steps to minimize the error difference

[P. 63, Eq. 1. Note that the equation suggests an order and at least one value is determined, namely, by applying the floor function]

9. Regarding claims 2 and 3, Gormish further discloses

- **(claim 2)** the first plurality of output data values are integers if the plurality of input data values are integers
- **(claim 3)** the plurality of output data values can be reconstructed exactly from the first plurality of output data values

[Per the analysis of claim 40]

10. Regarding claim 7, note that any invertible 2-dimensional diagonal matrix whose k-th (where k is the index of the only non-zero element of the input data values) diagonal element has a value of one (such as the identity matrix) satisfies the limitations.

11. Regarding claim 8, note that a nxn matrix (i.e., a linear transform) of a dimension suitable for the size of the input data, consisting of integral elements (e.g., the matrix [(2,0,0),(0,1,0),(0,0,1)], which is a kind of color transform when applied to color input values such as R, G and B by amplifying green), satisfies all its limitations:

- the plurality of input data values includes an input integer plurality and the second plurality of output data values includes an output integer plurality
- the linear transform mapping an integer multiple of the input integer plurality to an integer multiple of the integer output plurality, the integer multiple of the input integer plurality corresponding to the integer multiple of the integer output plurality
- the method mapping the integer multiple of the integer input plurality to the corresponding integer multiple of the integer output plurality [Note that the method in this case obviously is the application of the linear transform using a computer; each rows effects the replacement by a linear combination of input values]

12. Regarding claim 9, Gormish further discloses an RGB-to-YC_bC_r color transform [P. 64, Eq. 5].

13. Regarding claim 10, Official notice is taken that RGB-to-YIQ color transform is well known at the time of the invention and it would have been obvious for one of ordinary skill in the art to use this transform instead if it suites the intended applications.

14. Regarding claim 41, Gormish further discloses

- further comprising preserving a selected property in which $A(k\mathbf{1})=k\mathbf{e}_1$ where A is a matrix providing the linear transform, k is a constant, $\mathbf{1}$ is a vector with all entries equal to 1, and $\mathbf{e}_1$ is an elementary vector with a first entry of 1 and remaining entries of 0
[P. 63, Eq. 1. Recall that (per the analysis of claim 40) (Y,U_r,V_r) are the second plurality of output data values and (Y_r,U_r,V_r), Y_r being the floor value of Y, are the first plurality of output data values. It can be easily seen that for an integer constant k, when R=G=B=k, one has $Y=(R+2G+B/2)=4k/4=k=Y_r$ and $U_r=V_r=0$; therefore the limitation recited above is satisfied]

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

16. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gormish et al. ("Lossless and nearly lossless compression for high quality images," *Proc. SPIE*, Vol. 3025, March 1995, pp. 62-70) as applied to claims 2-3, 7-10, 40 and 41

and further in view of Daubechies et al. ("Factoring Wavelet Transforms into Lifting Steps," *J. Fourier Analysis Applications*, Vol. 4, No. 3, 1998, pp. 247-269).

17. Regarding claim 4, Gormish discloses all limitations of its parent, claim 40. In addition, the linear (color) transform disclosed in Gormish (i.e., the matrix of <(1/4,2/4,1/4),(1,-1,0),(0,-1,1)>, where each triplet represents a row; see the analysis of claim 1) has a determinant that is an integer ("-1" to be precise) and is therefore a degenerative form of a Laurent polynomial

Nonetheless, Daubechies discloses the use of a more general linear transform that

- has a determinant, the determinant being invertible as one of a group consisting of an integer and an integer Laurent polynomial [P. 8, last paragraph]

Gormish and Daubechies are combinable because they both have aspects that are form the same field of endeavor of transforms.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify Gormish with the teaching of Daubechies by using a linear transform that has a determinant with the recited characteristics. The motivation would have been to have the perfect reconstruction property (see P. 8, Eq. 2 and the two lines above it).

Therefore it would have been obvious to combine Daubechies with Gormish to obtain the invention as specified in claim 4.

18. Regarding claim 5, Daubechies further discloses

- rescaling at least one of a plurality of bands in the linear transform [P. 8, last four lines]

Allowable Subject Matter

19. Claims 12-18 and 39 are allowed. [Note: Claim 39 recites "combination of unmodified values" in lines 17, 23 and 26, each corresponding to one of three passes of data processing (recited in lines 16-19, 20-25 and 26-28, respectively). It is clear that "unmodified" in each pass is with respect to the processed data from its preceding pass and is so interpreted for examination purpose. **Note further that this interpretation was indicated in the Office action mailed 01/13/2006 and has not been traversed by Applicant.**]

20. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 39, closest art of record Gormish discloses the limitations recited in the first three paragraphs of the claim (per the analysis of claim 1). Additionally, Li et al. ("On implementing Transforms from integers to integers," Proc. ICIP, Vol. III, 4-7 Oct. 1998, pp. 881-885) discloses reversible integer-to-integer

transform (for a given linear transform). However, neither teaches nor suggests modifying at least one data value using the three passes as recited in the claim.

Conclusion and Contact Information

21. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yubin Hung whose telephone number is (571) 272-7451. The examiner can normally be reached on 7:30 - 4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on (571) 272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Yubin Hung
Patent Examiner
Art Unit 2624
July 13, 2004

JINGGE WU
PRIMARY EXAMINER